Emission Calculations

This attachment provides documentation of the calculations used to determine the emissions reductions and cost-effectiveness of the pieces of advanced equipment to be deployed through this project.

Vehicle Characteristics

Vehicle	# Units	Average Projected Annual Mileage	Average Miles Per Gallon (2008 equivalent diesel)
M2	3	49,019	7.85
eCascadia (Day Cab)	93	58,381	6.35

Emissions reductions for the project were determined using the U.S. Environmental Protection Agency's (EPA's) Diesel Emission Quantifier (DEQ) Tool. The backend exhaust emission rate inputs and calculations for the DEQ tool are based on the EPA's Motor Vehicle Emission Simulator (MOVES) 2014 simulator.

Average Per Vehicle Emissions Reductions

	M2	eCascadia
Annual ER NOx per truck (tons per year)	0.0709	0.2285
Annual ER PM2.5 per truck (TPY)	0.0014	0.0067
Annual ER HC per truck (TPY)	0.0070	0.0118

Total Short Term Emissions Reductions (1 Year)

	M2	eCascadia
Annual ER NOx total (tons per year)	0.2127	21.2506
Annual ER PM2.5 total (TPY)	0.0041	0.6220
Annual ER HC total (TPY)	0.0210	1.0959

Total Long Term Emissions Reductions (10 Years)

	M2	eCascadia
Lifetime ER NOx total (tons per year)	2.1269	212.5065
Lifetime ER PM2.5 total (TPY)	0.0409	6.2216
Lifetime ER HC total (TPY)	0.2105	10.9597

This attachment includes the following items:

1. Summary of emission calculations from the EPA's Diesel Emission Quantifier (DEQ) tool

Emission Results and Health Benefits for Project: DTNA Targeted Airshed

Emission Results

Here are the combined results for all groups and upgrades entered for your project.[1]

Annual Results (short tons)[2]	NO_x	PM2.5	HC	CO	CO_2	Fuel[3]
Baseline for Upgraded Vehicles/Engines	21.463	0.626	1.117	4.336	9,831.7	873,929
Amount Reduced After Upgrades	21.463	0.626	1.117	4.336	9,831.7	873,929
Percent Reduced After Upgrades	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Lifetime Results (short tons)[2]						
Baseline for Upgraded Vehicles/Engines	214.633	6.263	11.170	43.357	98,317.0	8,739,290
Amount Reduced After Upgrades	214.633	6.263	11.170	43.357	98,317.0	8,739,290
Percent Reduced After Upgrades	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Lifetime Cost Effectiveness ($/short ton reduced)						
Capital Cost Effectiveness[4] (unit & labor costs only)	$122,379	$4,194,182	$2,351,470	$605,823	$267	
Total Cost Effectiveness[4] (includes all project costs)	$23,296	$798,390	$447,618	$115,322	$51	

[1] Emissions from the electrical grid are not included in the results.

[2] 1 short ton = 2000 lbs.

[3] In gallons; fuels other than ULSD have been converted to ULSD-equivalent gallons.

[4] Cost effectiveness estimates include only the costs which you have entered.

Remaining Life

Estes eCas 2011: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Pepsi eCas 2007: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Estes eM2 2012: Short Haul - Single Unit | Class 6-7 Vehicle Replacement - All-Electric	10 years
Estes eCas 2012: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Pepsi eCas 2005: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Pepsi eCas 2006: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Ruan 6x4: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Sysco 6x4: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Schneider eCas 2014: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Schneider eCas 2017: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Schneider eCas 2018: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years
Penske eCas 2013: Short Haul - Combination | Class 8 Vehicle Replacement - All-Electric	10 years